Predisposing, Precipitating, and Perpetuating Factors of Insomnia in Cancer Survivors

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OBJECTIVES: To explore and characterize predisposing, precipitating, and perpetuating factors of subthreshold, moderate, and severe insomnia in cancer survivors.

SAMPLE & SETTING: 135 cancer survivors who self-reported symptom severity on the Insomnia Severity Index during the baseline phase of a randomized clinical trial on insomnia treatment.

METHODS & VARIABLES: Participants completed measures assessing predisposing factors (age, sex, race and ethnicity, body mass index), precipitating factors (number of years since cancer diagnosis, depression and anxiety symptoms, health-related quality of life), and perpetuating factors (frequency of consuming alcoholic and caffeinated beverages, napping behavior, dysfunctional beliefs about sleep).

RESULTS: In the multivariate model, being female was protective against insomnia, and being a person of color, having higher anxiety, having more depression symptoms, and having stronger dysfunctional beliefs about sleep were significantly associated with greater insomnia severity.

IMPLICATIONS FOR NURSING: By fostering interprofessional collaboration and implementing evidence-based interventions, nurses can contribute to the well-being of cancer survivors and address their sleep-related challenges. This study underscores the importance of regular insomnia screenings for cancer survivors, with nurses as essential facilitators.

KEYWORDS insomnia; sleep; cancer; survivors; assessment; oncology; Spielman model; 3P model

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Patients with cancer often experience various long-term physical and psychological sequelae even after treatment has been completed. Sleep disturbances, particularly insomnia (i.e., difficulty initiating or maintaining sleep or nonrestorative sleep, with resultant daytime impairment [American Academy of Sleep Medicine, 2014]), are commonly reported among people post–completion of cancer treatment, yet they have been overlooked in the integration of survivorship care plans (Otte et al., 2022; Savard et al., 2011). Results from a longitudinal study with heterogeneous cancer types that looked at a 12-month course of cancer-related insomnia post-treatment found a high prevalence of insomnia symptoms (about 50%) (Schieber et al., 2019). In addition, individuals with insomnia symptoms present during treatment had persistent and even greater symptom severity (64%) during the first year post-treatment (Schieber et al., 2019). Similarly, one in three cancer survivors continued to report symptoms of insomnia during the first two years post-treatment (Chan et al., 2023). The consequences of insomnia not only disrupt cancer survivors' physical, mental, and cognitive health (Davis & Goforth, 2014; Medic et al., 2017), but also affect their health-related quality of life (HRQOL) during and after the completion of active cancer treatment (Reynolds-Cowie & Fleming, 2021).

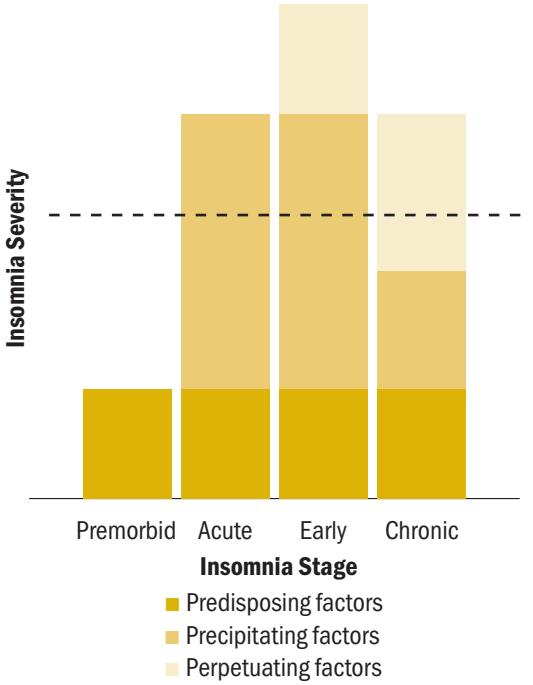
Spielman's 3P model, a widely accepted behavioral model for insomnia (Spielman et al., 1987), explains the development and maintenance of insomnia by incorporating the impact and different levels of influence of various traits and life stresses. In addition, the model recognizes that chronic insomnia is maintained (unintentionally) by maladaptive coping behaviors. Predisposing factors include the biopsychosocial aspect of insomnia and remain for the entire course of the insomnia disorder (Spielman et al., 1987). They include modifiable and nonmodifiable

factors that increase the risk of having insomnia, such as age, sex, personality traits, preexisting history of medical and psychiatric disorders, and genetic vulnerabilities (Drake et al., 2011; Harvey et al., 2014). Predisposing factors are then heightened by major life events or environmental stressors that trigger insomnia, pushing the individual above an "insomnia threshold" (Spielman et al., 1987). Precipitating factors associated with the onset of acute insomnia symptoms include new onset of medical or psychiatric illness, emergent life stress events (e.g., divorce, death of a loved one, moving, a new job) (Monroe & Simons, 1991, Pigeon et al., 2017), and the COVID-19 pandemic (Cox & Olatunji, 2021). As depicted in Figure 1, although precipitating factors may gradually subside over time, behaviors that exacerbate and maintain insomnia can be introduced. These behaviors, or perpetuating factors, include taking frequent and long naps during the day, engaging in activities not related to sleep in bed, increasing alcohol intake to induce sleep or caffeine intake for wakefulness, and spending excessive time in bed awake (Morin et al., 2006; Riemann et al., 2022). Perpetuating factors keep the individual over the insomnia threshold (chronic insomnia), making insomnia cyclical in nature (Spielman et al., 1987).

There is evidence that being aged younger (Desai et al., 2013), being female (Savard et al., 2009), having a higher body mass index (BMI) (Aronsen et al., 2022), and being a person of color (Otte et al., 2010) increase the risk of insomnia in people with a history of cancer. Among breast cancer survivors, those diagnosed with cancer two to five years prior were significantly more likely to report insomnia than those diagnosed within the past two years (Desai et al., 2013). In another study, there was an increased risk of developing insomnia among cancer survivors (those diagnosed with cancer 11 or more years prior) compared with individuals without a history of cancer (Slade et al., 2020). Experiencing symptoms of depression and anxiety were identified as risk factors for insomnia among cancer survivors (Chan et al., 2023; Maguire et al., 2019; Savard et al., 2009). Cancer survivors with a lower QOL had a significantly higher risk of poor sleep quality (Nock et al., 2020), and those reporting higher QOL had lower risk of poor sleep quality (Ueno et al., 2022). In addition, dysfunctional beliefs about sleep (i.e., misconceptions about the causes of insomnia, misattributions of the consequences of insomnia, and unrealistic sleep expectations) were associated with an increased risk of insomnia among cancer survivors (Savard et al., 2009). Finally, a study using a qualitative approach to assess predisposing, precipitating, and perpetuating factors found that behaviors such as napping may contribute to the development and maintenance of insomnia in cancer survivors (Garland, Barg, et al., 2019).

Despite the aforementioned findings and increasing awareness of the pervasiveness of insomnia, there is still limited research devoted to understanding the association between factors and severity of insomnia symptoms among a heterogeneous sample of cancer survivors with self-reported insomnia. A greater understanding of the factors that put cancer survivors at risk for more severe insomnia problems is warranted. In addition, knowledge gained by identifying individual-level predictors of cancer-related insomnia is anticipated to be fundamental to the optimization of HRQOL for cancer survivors, behavioral prevention, and treatment protocols. Thus, the aim of the current study was to explore

FIGURE 1. Representation of the 3P Model of Insomnia



Note. The dashed line indicates the insomnia threshold.
Note. From "A Behavioral Perspective on Insomnia Treatment," by A.J. Spielman, L.S. Caruso, & P.B. Glovinsky, 1987, *Psychiatric Clinics of North America, 10*(4), p. 546 (https://doi.org/10.1016/S0193-953X(18)30532-X). Copyright 1987 by Elsevier. Adapted with permission.

and characterize predisposing, precipitating, and perpetuating factors of subthreshold, moderate, and severe insomnia in cancer survivors with self-reported insomnia symptoms. Aligned with previous research, the authors hypothesized that predisposing, precipitating, and perpetuating factors would be associated with insomnia severity (subthreshold or clinical insomnia). Specifically, the authors hypothesized that predisposing factors (younger age, female sex, being a person of color, and BMI outside of the healthy range), precipitating factors (being diagnosed with cancer for five years or more, higher anxiety, depression symptoms, and lower HRQOL), and perpetuating factors (napping, consuming higher numbers of alcoholic or caffeinated beverages, and having more dysfunctional beliefs and attitudes about sleep) would be associated with worse insomnia severity.

Methods

Participants and Procedure

This cross-sectional study used baseline data from a longitudinal randomized controlled trial that examined the effectiveness of brief behavioral treatment for insomnia in cancer survivors with insomnia symptoms. Cancer survivors were defined as individuals who were one month or more post-treatment (except for those receiving hormones or targeted therapies, who could participate in the study while undergoing treatment) and who were diagnosed with stage I, II, or III breast, colorectal, lung, or prostate cancer. Having insomnia was defined as having an Insomnia Severity Index (ISI) score of 8 or higher (Savard et al., 2005). Other inclusion criteria were (a) being aged 18 years or older and (b) having no preexisting sleep disorder (i.e., breathing sleep disorder) based on the Holland Sleep Disorders Questionnaire (Kerkhof et al., 2013). However, individuals with obstructive sleep apnea who self-reported adherence (four hours or more per night) to use of continuous positive airway pressure were eligible to participate. Participants were excluded if they had a positive result for a breathing sleep disorder based on the Holland Sleep Disorders Questionnaire (Kerkhof et al., 2013) or a positive ApneaLink™ Plus screening for obstructive sleep apnea (hypopnea index of more than 15 events per hour recorded during at least four hours per night). Participants were also excluded who had unstable medical or psychiatric illness, worked shiftwork, or had traveled across two or more time zones within one month prior to study participation. Kwon et al. (2022) reported detailed information about the main study procedure.

Participants were recruited through Roswell Park Comprehensive Cancer Center in Buffalo, New York, a National Cancer Institute–designated comprehensive cancer center, and written informed consent was obtained. Participants completed the brief screening measure, and eligible participants completed baseline questionnaires either in person or using a personalized online link via a secure web-based data collection tool (REDCap). All procedures were approved by the institutional review board at the University at Buffalo and Roswell Park Comprehensive Cancer Center prior to the start of data collection, and the study was registered at ClinicalTrials.gov (identification number: NCT03810365).

Measures

Insomnia severity: The ISI is a well-validated measure of insomnia symptoms that assesses the nature, severity, and impact of insomnia (Bastien et al., 2001; Morin et al., 1993) and has been validated among cancer survivors (Yusufov et al., 2019). Seven items are scored on a five-point Likert-type scale ranging from 0 (no insomnia) to 4 (severe insomnia), then summed to provide a score ranging from 0 to 28, with higher scores reflecting greater symptom severity. Based on the summed score, ISI results are categorized as follows: no clinically significant insomnia (0–7), subthreshold/mild insomnia (8–14), moderate clinically significant insomnia (15–21), and severe clinically significant insomnia (22–28). Of note, in the current study, participants with scores between 0 and 7 were not eligible to participate. In the total sample (N = 135), 89 (66%) participants reported having subthreshold insomnia, 40 (30%) reported moderate clinically significant insomnia, and 6 (4%) reported severe clinically significant insomnia. For purposes of analysis, the authors dichotomized the sample to subthreshold insomnia (n = 89, 66%) and clinical insomnia groups (i.e., clinically significant moderate and severe insomnia) (n = 46, 34%) .

Measures of predisposing factors: Demographic variables included age, sex, race and ethnicity, and BMI. Variables were dichotomized as follows: (a) age as younger than 64 years and 65 years or older, (b) sex as female and male, (c) race and ethnicity as non-Hispanic White and person of color (including non-Hispanic Black, Asian, Hispanic, American Indian or Alaska Native, and other), and (d) BMI as healthy (18.5–25 kg/m^2) or outside of the healthy range (less than 18.5 kg/m^2 or greater than 25 kg/m^2). For BMI,

the underweight and obese categories were combined because less than 1% (n = 1) of the participants were in the underweight category.

Measures of precipitating factors: Number of years since cancer diagnosis was assessed and dichotomized into less than five years and five or more years (JAMA Network, 2015). Depression and anxiety symptoms were measured using the Hospital Anxiety and Depression Scale. The Hospital Anxiety and Depression Scale is a 14-item questionnaire that assesses levels of anxiety (7 items) and depression (7 items) in the past week on a four-point Likert-type scale ranging from 0 (not at all) to 3 (definitely or most of the time) (Zigmond & Snaith, 1983). Scores can range from 0 to 21 for the anxiety and depression subscales (Lambert et al., 2013), with results categorized as normal (0–7), borderline abnormal (8–10), or abnormal (11–21). For analytic purposes, the authors further dichotomized the Hospital Anxiety and Depression Scale score for each subscale as normal (less than 8) and abnormal (8 or greater). HRQOL was assessed using the Functional Assessment of Cancer Therapy–General (Cella et al., 1993), which is a 27-item questionnaire that assesses HRQOL in patients with cancer in the past week and has been used among cancer survivors (Ferrell et al., 1995). It consists of the following four domains: physical, social, emotional, and functional well-being. Each domain has six to eight items, which are rated on a five-point Likert-type scale ranging from 0 (not at all) to 4 (very much). Summed scores range from 0 to 108; higher scores indicate better HRQOL.

Measures of perpetuating factors: Ecological momentary assessment relying on an automated electronic survey (REDCap) or paper survey per participant preference was used to obtain participants' sleep-related behaviors such as caffeine intake, alcohol intake, and minutes spent napping (Carney et al., 2012). In seven consecutive days of morning surveys, participants were asked, "How many alcoholic beverages did you have yesterday (including alcohol, beer, and wine)?" and "How many caffeinated beverages did you have yesterday (including coffee, tea, pop, soda, and energy drinks)?" Responses could range from zero to six or more. The pattern of alcohol and caffeinated beverages consumed for each day was averaged and categorized as follows: (a) zero beverages per week, (b) one to two beverages per week, or (c) three or more beverages per week. In addition, total minutes napped were collected. For this study, participants were categorized as nappers if they reported at least one nap during the past week and as non-nappers if there was no nap occurrence in the past week, in line with the previous literature (Owens et al., 2010).

The Dysfunctional Beliefs and Attitudes About Sleep Scale (DBAS) is a 30-item scale that assesses sleep-related perceptions and attitudes (i.e., consequences of insomnia, perception of control and predictability of sleep, sleep expectations, causes of insomnia, and beliefs about sleep-promoting practices) (Espie et al., 2000; Morin et al., 1993). Each item is rated on a 10-point Likert-type scale, ranging from 0 (strongly disagree) to 10 (strongly agree); higher DBAS scores indicate higher levels of dysfunctional sleep-related beliefs and attitudes.

Data Analysis

Summary statistics were computed for participants' demographic factors and 3P model–related factors as means and SDs for continuous measures and as frequencies and percentages for categorical measures. The authors did not have missing values pertaining to the variables used in the current study. The association of each 3P factor with the binary outcome (subthreshold insomnia versus clinical insomnia) was examined using simple logistic regression. Multivariate logistic analysis was used to investigate the simultaneous association of all 3P factors with insomnia. The estimated covariance matrix of model coefficient estimates was examined to ensure the lack of multicollinearity issues associated with the multivariate model. Resulting parameter estimates from the simple and multivariate models were used to compute unadjusted and adjusted odds ratios (ORs), respectively, along with corresponding 95% confidence intervals (CIs). A two-sided p value of less than 0.05 was considered statistically significant. All statistical analyses were performed using SAS, version 9.4.

Results

Sample Characteristics

Table 1 presents a comprehensive summary of the demographic and 3P factors of participants (N = 135) in the current study. More than half of the participants were female (n = 75, 56%), and 54% (n = 73) of participants were aged 65 years or older. The majority of participants self-identified as non-Hispanic White (n = 119, 88%), followed by non-Hispanic Black (n = 10, 7%), Hispanic (n = 2, 2%), other racial or ethnic background (n = 2, 2%), Asian or Pacific Islander (n = 1, 1%), and American Indian or Alaska Native (n = 1, 1%). The authors dichotomized race as (a) non-Hispanic White and (b) person of color for the logistic regression modeling.

TABLE 1. Demographic and Clinical Information for Study Participants by Insomnia Severity Index Subthreshold Insomnia Group and Clinical Insomnia Group (N = 135)

	Total (N = 135)		Subthreshold Insomnia (N = 89)		Clinical Insomnia (N = 46)	
Variable	**$\bar{X}$**	**SD**	**$\bar{X}$**	**SD**	**$\bar{X}$**	**SD**
FACT-G	83.84	13.41	87.63	9.71	76.52	16.38
DBAS	3.94	1.06	3.67	0.87	4.47	1.19
Variable	**n**	**%**	**n**	**%**	**n**	**%**
Age (years)						
Younger than 65	62	46	38	43	24	52
65 or older	73	54	51	57	22	48
Sex						
Female	75	56	55	62	20	44
Male	60	44	34	38	26	57
Race and ethnicity						
American Indian or Alaska Native	1	1	1	1	–	–
Asian or Pacific Islander	1	1	–	–	1	2
Hispanic	2	2	–	–	2	4
Non-Hispanic Black	10	7	3	3	7	15
Non-Hispanic White	119	88	84	94	35	76
Other	2	2	1	1	1	2
Marital status						
Married or common-law	92	68	62	70	30	65
Separated or divorced	22	16	14	16	8	17
Widowed	11	8	9	10	2	4
Single	10	7	4	5	6	13
Employment status						
Unemployed, retired, unable to work, or other	68	50	43	48	25	54
Full-time	42	31	28	32	14	30
Part-time	25	19	18	20	7	15
Body mass index (kg/m^2)						
Less than 18.5 (underweight)	1	1	1	1	–	–
18.5–25 (healthy)	44	33	33	37	11	24
25–30 (overweight)	53	39	35	39	18	39
30 or more (obese)	37	27	20	23	17	37
Cancer type						
Breast	61	45	46	52	15	33
Prostate	48	36	25	28	23	50
Colorectal	19	14	13	15	6	13
Lung	7	5	5	6	2	4
Time since cancer diagnosis (years)						
Less than 5	61	45	34	38	27	59
5 or more	74	55	55	62	19	41

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TABLE 1. Demographic and Clinical Information for Study Participants by Insomnia Severity Index Subthreshold Insomnia Group and Clinical Insomnia Group (N = 135) *(Continued)*

	Total (N = 135)		Subthreshold Insomnia (N = 89)		Clinical Insomnia (N = 46)	
Variable	**n**	**%**	**n**	**%**	**n**	**%**
Average number of alcoholic beverages per week						
0	62	46	38	43	24	52
1–2	64	47	44	50	20	44
3 or more	9	7	7	8	2	4
Average number of caffeinated beverages per week						
0	18	13	13	15	5	11
1–2	86	64	54	61	32	70
3 or more	31	23	22	25	9	20
Average napping time per day (minutes)						
0	40	30	24	27	16	36
Less than 20	59	45	41	47	18	41
20 or more	33	25	23	26	10	23
HADS–anxiety						
Normal (0–7)	107	79	80	90	27	59
Borderline abnormal (8–10)	16	12	5	6	11	24
Abnormal (11–21)	12	9	4	5	8	17
HADS–depression						
Normal (0–7)	125	93	88	99	37	80
Borderline abnormal (8–10)	8	6	1	1	7	15
Abnormal (11–21)	2	2	–	–	2	4

DBAS—Dysfunctional Beliefs and Attitudes About Sleep Scale; FACT-G—Functional Assessment of Cancer Therapy–General; HADS—Hospital Anxiety and Depression Scale
Note. Because of rounding, percentages may not total 100.
Note. For average napping time per day, only 132 participants responded.

The BMI distribution revealed that 33% (n = 44) of participants had a healthy BMI, 39% (n = 53) were overweight, and 27% (n = 37) were obese, which were then dichotomized as healthy and outside of the healthy range for modeling purposes. The study sample encompassed various cancer types, with breast cancer being the most prevalent (n = 61, 45%), followed by prostate cancer (n = 48, 36%), colorectal cancer (n = 19, 14%), and lung cancer (n = 7, 5%). More than half of the participants had been diagnosed with cancer for five or more years (n = 74, 55%). Ninety-two (68%) participants were married or in a common-law relationship, and fewer participants were single (n = 10, 7%), separated or divorced (n = 22, 16%), or widowed (n = 11, 8%). The employment status of the sample varied, with 31% (n = 42) working full-time, 19% (n = 25) working part-time, and 50% (n = 68) being unemployed, retired, unable to work, or other.

Few participants reported anxiety (n = 28, 21%) and depression symptoms (n = 10, 8%). Almost half of the total participants (n = 62, 46%) reported consuming no alcoholic drinks per week, and 64 (47%) consumed one to two drinks per week. The majority of participants (n = 86, 64%) reported consuming one to two caffeinated beverages per week. The average napping time per day in a week varied, with almost half (n = 59, 45%) reporting naps of less than 20 minutes per day. The mean score for HRQOL was

83.84, indicating relatively good overall HRQOL. The mean DBAS score was 3.94, indicating relatively less endorsement of dysfunctional beliefs and attitudes about sleep. Between groups, the mean DBAS score was 3.67 for the subthreshold insomnia group and 4.47 for the clinical insomnia group.

Univariate and multivariate analyses were conducted to examine the association between various 3P factors and the insomnia groups (see Table 2). In the univariate analysis, seven factors showed significant associations with insomnia. Among predisposing factors, being female (OR = 0.476, 95% CI [0.231, 0.98], p = 0.0439) was associated with a lower likelihood of clinical insomnia than being male. Being a person of color (OR = 5.28, 95% CI [1.709, 16.317], p = 0.0038) was associated with a higher risk of clinical insomnia than being non-Hispanic White.

Among precipitating factors, a greater number of years since cancer diagnosis (OR = 0.435, 95% CI [0.21, 0.899], p < 0.0.0247), and higher HRQOL (OR = 0.93, 95% CI [0.898, 0.963], p < 0.0001) were significantly associated with a lower likelihood of belonging to the clinical insomnia group. Higher levels of anxiety (OR = 6.255, 95% CI [2.53, 15.465], p < 0.0001), and depression (OR = 21.387, 95% CI [2.617, 174.773], p = 0.0043) were significantly associated with an increased likelihood of clinical insomnia. Among perpetuating factors, stronger dysfunctional beliefs and attitudes about sleep (OR = 2.257, 95% CI [1.497, 3.403], p < 0.0001), among other variables, were significantly associated with an increased likelihood of clinical insomnia.

In the multivariate analysis, the associations remained significant for individuals who were female (OR = 0.186, 95% CI [0.057, 0.606], p = 0.0052) or identified as people of color (OR = 6.521, 95% CI [1.241, 34.252], p = 0.0267). Similarly, having anxiety (OR = 5.776, 95% CI [1.251, 26.665], p = 0.0246), depression symptoms (OR = 17.306, 95% CI [1.233, 242.925], p = 0.0344), and stronger dysfunctional beliefs and attitudes about sleep (OR = 2.339, 95% CI [1.318, 4.151], p = 0.0037) retained their significant associations with clinical insomnia. However, number of years since cancer diagnosis and HRQOL did not show significant associations in the multivariate model.

Discussion

The current study used the 3P model to examine the associations among predisposing, precipitating, and perpetuating factors and the development and maintenance of insomnia in cancer survivors. In the univariate model, the findings suggest that being female, having a greater number of years since cancer diagnosis, and having a higher HRQOL are protective factors against insomnia, and that being a person of color, having higher anxiety, having more depression symptoms, and having stronger dysfunctional beliefs about sleep are significantly associated with a greater risk of clinical insomnia. In the multivariate model, being female was a protective factor against insomnia, and being a person of color, having higher anxiety, having more depression symptoms, and having stronger dysfunctional beliefs about sleep were significantly associated with a greater risk of clinical insomnia.

Contrary to the authors' original hypothesis, being female and having longer time since cancer diagnosis were protective factors against insomnia severity. One potential reason that being female was protective could be related to the type or severity of cancer in the study sample. This is one of the first studies to include a heterogeneous sample of cancer survivors with self-reported insomnia; thus, it could be that the cancer or the treatments for the breast cancer group were less severe or that the female participants in this group had more support for symptom management.

Another postulation is that although the prevalence of insomnia is higher among female individuals than male individuals (Zeng et al., 2020), when female and male individuals self-report symptoms of insomnia and self-enroll in an interventional insomnia research study, male participants may tend to report a more severe level of symptoms and sleep complaints than female participants. In addition, few participants had self-reported symptoms of anxiety and depression, which could have also contributed to identifying as female being protective against insomnia. Kwak et al. (2020) discussed hot flashes, estrogen levels, and chest wall pain, among other factors, as causes of sleep problems in patients with breast cancer. Future research should examine these factors, including menopausal status and its contribution to the 3P model in this population. The authors' findings were not aligned with one study that found women diagnosed with breast cancer more than five years prior to be more likely to have insomnia (Desai et al., 2013). Attention bias was not assessed in either study, and that could have contributed to these findings and discrepancies (Taylor et al., 2003). Further research is necessary to help elucidate these findings.

This study found no significant associations among age, BMI, napping, alcohol intake, caffeine intake, or clinical insomnia. Similar to the current study, Aronsen et al. (2022) found that after adjusting

TABLE 2. Logistic Regression Analysis of 3P Model Factors Potentially Related to Insomnia Symptom Severity (N = 135)

	Univariate Analysis			Multivariate Analysis		
Characteristic	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**
Predisposing factors						
Age (years)						
Younger than 65	1	–	–	1	–	–
65 or older	0.683	[0.334, 1.396]	0.2959	1.008	[0.355, 2.859]	0.9881
Sex						
Male	1	–	–	1	–	–
Female	0.476	[0.231, 0.98]	0.0439*	0.186	[0.057, 0.606]	0.0052**
Race/ethnicity						
Non-Hispanic White	1	–	–	1	–	–
Person of color[a]	5.28	[1.709, 16.317]	0.0038**	6.521	[1.241, 34.252]	0.0267*
Body mass index						
Healthy	1			1		
Outside of healthy range	1.874	[0.84, 4.182]	0.1249	2.501	[0.787, 7.95]	0.1203
Precipitating factors						
Time since cancer diagnosis (years)						
Less than 5	1	–	–	1	–	–
5 or more	0.435	[0.21, 0.899]	0.0247*	1.179	[0.405, 3.431]	0.7629
HADS–anxiety						
Normal	1	–	–	1	–	–
Borderline abnormal/ abnormal	6.255	[2.53, 15.465]	< 0.0001***	5.776	[1.251, 26.665]	0.0246*
HADS–depression						
Normal	1	–	–	1	–	–
Borderline abnormal/ abnormal	21.387	[2.617, 174.773]	0.0043**	17.306	[1.233, 242.925]	0.0344*
Health-related quality of life						
FACT-G	0.930	[0.898, 0.963]	< 0.0001***	0.989	[0.936, 1.045]	0.6862
Perpetuating factors						
Average number of alcoholic beverages per week						
0	1	–	–	1	–	–
1–2	0.72	[0.345, 1.501]	0.8924	1.595	[0.537, 4.735]	0.3929
3 or more	0.452	[0.087, 2.361]	0.4451	0.84	[0.108, 6.547]	0.6854
Average number of caffeinated beverages per week						
0	1	–	–	1	–	–
1–2	1.541	[0.503, 4.723]	0.3128	2.293	[0.505, 10.399]	0.1044
3 or more	1.064	[0.293, 3.865]	0.7517	0.775	[0.133, 4.503]	0.3463

Continued on the next page

TABLE 2. Logistic Regression Analysis of 3P Model Factors Potentially Related to Insomnia Symptom Severity (N = 135) *(Continued)*

	Univariate Analysis			Multivariate Analysis		
Characteristic	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**
Perpetuating factors *(continued)*						
Napped in past week						
Did not nap	1	–	–	1	–	–
Napped	0.656	[0.303, 1.421]	0.2854	0.896	[0.309, 2.596]	0.8392
Sleep-related perceptions						
DBAS	2.257	[1.497, 3.403]	< 0.0001***	2.339	[1.318, 4.151]	0.0037**

* p < 0.05; ** p < 0.01; *** p < 0.0001

[a] Person of color includes individuals who identified as non-Hispanic Black, Hispanic, Asian or Pacific Islander, and American Indian or Alaska Native.

CI—confidence interval; DBAS—Dysfunctional Beliefs and Attitudes About Sleep Scale; FACT-G—Functional Assessment of Cancer Therapy–General; HADS—Hospital Anxiety and Depression Scale; OR—odds ratio

Note. The p value was obtained from the Wald test, and the OR value was obtained from logistic regression.

for being female, having a higher number of cancer treatments, having more comorbid conditions, and being more anxious or depressed, there were no associations among diet, alcohol, physical activity, and sleep. However, they found a significant relationship between BMI and insomnia, which was not found in the current study. One explanation is that the current study screened out obstructive sleep apnea, so the effect of variation in BMI may have been too minimal to detect any differences. In addition, in one qualitative study, participants identified napping as a perpetuating factor for insomnia (Garland, Barg, et al., 2019). The current study's sample had low rates of napping in general, which might have contributed to the nonsignificant findings. More research is needed to explore the timing of naps and the duration, frequency, and intention of napping in this group.

Findings from this study add to what is known about the relationships among race, depression and anxiety symptoms, dysfunctional beliefs about sleep, HRQOL, and insomnia. Aligned with the authors' hypothesis and consistent with previous research (Chan et al., 2023; Maguire et al., 2019; Savard et al., 2009), being a person of color, having depression and anxiety symptoms, and having dysfunctional beliefs about sleep were all associated with worse insomnia symptom severity, and having better HRQOL was protective (Nock et al., 2020; Ueno et al., 2022) against more severe insomnia symptoms. The associations among anxiety, depression, and dysfunctional beliefs about sleep and insomnia are well established in the literature (Hertenstein et al., 2019; Leysen et al., 2019). In addition, better HRQOL likely indicates more positive coping strategies that can help protect against insomnia symptoms.

Although the relatively small sample size in the current study prohibited more in-depth investigation into the five subscale domains of the DBAS (consequences of insomnia, control and predictability of sleep, sleep requirement expectations, causal attribution of insomnia, and sleep-promoting practices), future studies should seek to understand the unique role of beliefs and expectations in the development of insomnia in cancer survivors post-treatment. This study also found that the ecological momentary behaviors from the sleep diary (i.e., alcohol and caffeine use, and napping) were not significantly associated with insomnia severity. This could be a function of social desirability bias or lack of power in the current study and warrants future research on sleep-related behaviors.

Limitations

The results of this study should be interpreted in light of the limitations. First, the current study drew from a modest sample of cancer survivors based on a diagnosis of breast, prostate, colorectal, or lung cancer, and who were primarily White (88%) and recruited from a major comprehensive cancer center and ancillary sites in the greater Western New York area; therefore, these findings may not be generalizable to larger and more diverse samples of cancer survivors. Similarly, the study's sample consisted of a relatively lower proportion of participants with

anxiety and depression than a comparable sample of cancer survivors (Haque et al., 2021; Maguire et al., 2019); thus, the results should be interpreted with caution, considering that the low prevalence of anxiety and depression may affect the statistical power and generalizability of the study's findings. Second, the present study explored how predisposing, precipitating, and perpetuating factors are associated with insomnia severity; however, all variables were measured concurrently, which precludes causal interpretations. Third, all data were collected via self-report. Fourth, the authors used the standard cutoffs of the ISI to draw conclusions about insomnia severity, but previous studies have used other modes of assessment and cutoffs (e.g., sleep efficiency, Pittsburgh Sleep Quality Index), which may impede the comparison between studies.

Fifth, there are a few predictors that would have been examined if included in the parent study. For example, this study did not gather information on participants' socioeconomic status, menopausal status, the use of electronic devices around bedtime, pain level, or stress level (including fear of cancer recurrence). Future studies should consider gathering and including hypothesis-driven protective factors such as the cancer survivors' social and esteem support, personality traits, and coping styles, in line with the 3P model. Sixth, the authors' attempt to predict insomnia severity using 3P factors is confounded by the bidirectional or cyclical relationship between 3P factors and some insomnia variables. For instance, having insomnia symptoms has been found to increase depression and anxiety symptoms (Hertenstein et al., 2019). Insomnia at baseline has also been associated with heavy alcohol consumption and use at follow-up (Haario et al., 2013). Thus, insomnia itself may lead to changes in the severity of 3P factor variables, which may affect other unhealthy behaviors and health outcomes. Further studies may use controlled experimental or daily association research design over time to overcome this limitation.

Implications for Nursing

In light of these research findings, which provide deeper insight into insomnia within the context of cancer survivorship and its nursing implications, it is crucial to consider the broader healthcare perspective. These insights compel the authors to advocate for a proactive approach to address insomnia among cancer survivors. The role of oncology nurses is multifaceted, with patient encounters occurring in diverse care settings, such as bedside care and clinic consultations, and spanning different shift hours, including day and night. To best serve the needs of cancer survivors, it is essential for nurses to establish a fundamental understanding of sleep, sleep disorders, and common sleep-related complaints. This knowledge empowers nurses to engage in more effective and insightful conversations during patient interactions, fostering a higher level of care. In conjunction, the authors propose the routine screening of insomnia symptoms during cancer survivors' visits to primary care physicians or cancer survivorship clinics, with nurses being at the forefront of this screening process.

Nurses are uniquely positioned to play a pivotal role in identifying and assessing insomnia symptoms because they are often the first point of contact for patients. This role involves not only recognizing the signs of insomnia, but also providing education and support to survivors regarding sleep-promoting practices and evidence-based strategies to manage sleep disturbances. In addition, as healthcare professionals, it is nurses' responsibility to collaborate with interprofessional teams, including physicians, psychologists, and physical therapists, to develop holistic and personalized interventions aimed at improving sleep quality for cancer survivors. By addressing sleep issues comprehensively (Garland, Mahon, & Irwin, 2019), nurses can contribute significantly to optimizing the overall health and well-being of cancer survivors and fostering a holistic approach to patient care. Finally, one-third of the current sample who self-reported sleep disturbances reported moderate to severe clinical symptoms of insomnia. This underscores the critical need for a patient-centered and precise approach to address the heightened risk among these individuals self-reporting sleep disturbances.

KNOWLEDGE TRANSLATION

- Identifying nonmodifiable and modifiable risk factors highlights opportunities for addressing insomnia and raising awareness of potential treatments.
- Nurses can play a crucial role in championing the routine screening of insomnia symptoms in cancer survivors during their visits to primary care providers or cancer survivorship clinics.
- Potential interventions, such as cognitive and behavioral approaches, offer the prospect of alleviating insomnia severity and ultimately enhancing the sleep quality and quality of life for cancer survivors.

Conclusion

In summary, this study examined the association among potential predisposing, precipitating, and perpetuating factors and insomnia severity in cancer survivors with insomnia symptoms. Being a person of color and having higher anxiety, more depression symptoms, and stronger dysfunctional beliefs about sleep were risk factors for clinical insomnia; being female was a protective factor; and age, BMI, number of years since cancer diagnosis, HRQOL, frequency of consuming alcoholic and caffeinated beverages, and napping behavior did not predict insomnia severity. The authors' findings add to the literature underscoring the importance of routinely screening cancer survivors for insomnia symptoms during healthcare visits. These findings also support optimizing behavioral prevention and treatment protocols to target individual-level predictors of cancer-related insomnia that contribute to diminished QOL in cancer survivors.

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